(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 103 985**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 83304745.9

(22) Date of filing: 16.08.83

(51) Int. Cl.³: F 01 B 13/06

(30) Priority: 20.08.82 US 409978

(43) Date of publication of application:
28.03.84 Bulletin 84/13

(84) Designated Contracting States:
DE FR GB IT

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(54) **Rotary engine or compressor.**

(57) A rotary device, such as an engine wherein compression arms are pivoted on a cylindrical rotor to oscillate in recesses opening from the cylindrical periphery of the rotor, pivoting away from the periphery during expansion and toward the periphery during compression. Cam followers on the compression arms engage in a generally oval cam track on the housing so that there are two complete oscillates, or four cycles, during each revolution of the rotor.

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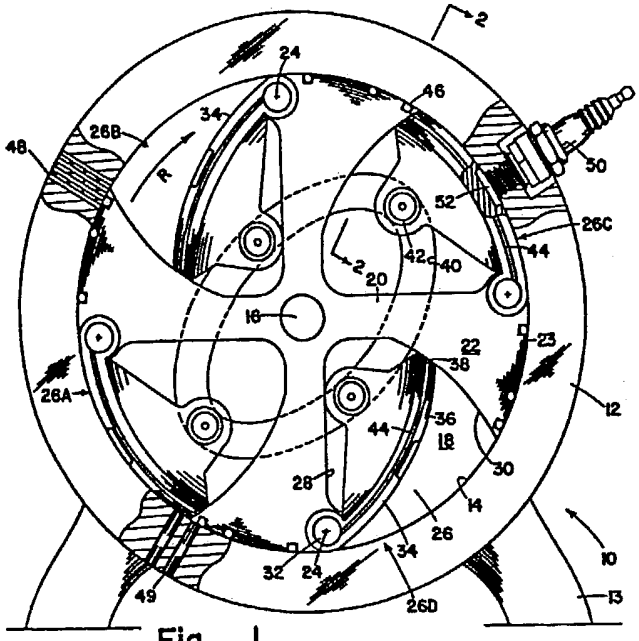
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26B
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R
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26C
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26A
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18
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26
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26D
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Fig. 1

ROTARY ENGINE OR COMPRESSOR

BACKGROUND OF THE INVENTION

Internal combustion engines have, traditionally, been of the piston type wherein the force of an explosion acting on the piston head is delivered by the piston rod to a crankshaft and thereby converted to rotary motion. Such engines require separate cylinders in the engine block for each piston, each with intake and exhaust valves, and generally have a high size to output ratio. Moreover, because the rotary output of the engine is converted from the reciprocating motion of the pistons, there is inevitably, some vibration despite the provision of counter-weights and the like. Also a certain amount of clattering may be expected as the valves are seated and unseated during each cycle of operation.

In order to overcome some of the problems just discussed in connection with reciprocating engines, others have attempted to produce a feasible rotary engine wherein a rotor cooperates with a stator to form an expanding and contracting combustion chamber during each revolution, there being no need to convert from reciprocating movement as with the pistons of a conventional internal combustion engine. If feasible, such engines could be made much more compact, because there is no need for separate cylinders and pistons and no need for a crankshaft. Also to be eliminated are the conventional, reciprocating poppet valves because intake and exhaust ports can be covered and uncovered by the rotor itself.

OBJECTS OF THE INVENTION

It is an object of this invention to provide a commercially feasible rotary engine.

It is a further object of this invention to provide a rotary engine wherein a cylindrical rotor maintains a continuous, sliding, sealing engagement with the cylindrical inner surface of a stator housing.

It is a further object of this invention to provide a rotary engine capable of producing four-cycle operation during each revolution.

It is a further object of this invention to provide a rotary engine having a plurality of circumferentially spaced combustion chambers.

Other objects and advantages of this invention will become apparent from the description to follow, particularly when read in conjunction with the accompanying drawing.

SUMMARY OF THE INVENTION

In carrying out this invention, I provide a generally cylindrical rotor which is rotatable within a complementary cylindrical inner surface of a housing. Recesses or cavities are formed in each quadrant of the rotor and in each cavity, a compression arm is pivoted on an axis near the periphery of the rotor to swing from a compressing position, wherein it is disposed along the periphery of the rotor, to an expanded position wherein it is displaced radially inward from the periphery, moving along an arcuate wall of the cavity, which has its pivotal axis as its center of rotation. Cam followers on the arm engage in a generally oval track on the housing so that there are two complete oscillations or four cycles of operation during each revolution of the rotor.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is an elevation view, partially broken away and with side cover removed of a rotary engine embodying features of this invention; and

FIG. 2 is a section view taken along line 2-2 of FIG. 1.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing with greater particularity, the rotary engine or compressor 10 of this invention including an outer stator or housing 12, which may be mounted on suitable supports 13 and which has an inner cylindrical surface 14. Carried on a shaft 16 which is rotatably mounted between sidewalls 18 of the housing 12 is a rotor 20, which in operation rotates in the direction of the arrow R. The rotor is of generally cruciform configuration with four radial spokes or arms 22 having complementary cylindrical outer surfaces 23.

Spaced at 90° intervals around the rotor 20 are pivotal axes 24. Adjacent each pivotal axis is a compression cavity 26 having a generally radial wall 28 and an arcuate wall 30 formed on an arc 30 about each pivotal axis 24.

Pivotally carried on suitable pins 32 to pivot about each axis 24 is a compression arm 34 having a working outer side surface 36 which forms a continuation of the periphery 23 of the rotor 20 and a slide surface 38 complementary with the arcuate surface 30 of the cavity 26.

A cam track 40 of generally oval configuration is routed or otherwise formed in the housing side walls 18 (only one being shown) and cam follower rollers 42 is carried on each of the compression arms 34. Because of the generally oval configuration of the track 40, the cam followers 42 cause each compression arm 34 to make two complete oscillations, or four strokes, during each revolution of the rotor within the housing or stator 12. Suitable seal means 44 may be provided on the slide surface 38 and sides of the compression arms 34 to prevent blow by of gases during such oscillating movements. Similarly, seal means 46 are provided on the periphery of the rotor 20 so that each cavity 26 is an isolated gas chamber.

Gas intake ports 48 are provided in the stator 12, as are gas exhaust ports 49.

In operation, as a compression chamber or cavity 26 moves from the position shown at 26A to that shown at 26B, during rotation in the direction R it uncovers the gas inlet ports 48 while the compression arm 34 is

withdrawn inward to its fully retracted position, drawing a full charge of gas into the chamber 26. Then, as it moves toward the position shown at 26C, the inlet ports 48 are sealed off by seal members 46, and the arm 34 oscillates outward to the full compression position shown at 26C, at which time the outer working surface 36 of the compression arm 34 forms a virtual continuation of the periphery 23 of the rotor 22. At this point, ignition occurs and, in the case of a gasoline engine, a suitable spark plug 50 is provided for ignition. A cavity 52 may be provided in the outer surface 36 of the compression arm 34 to serve as an ignition chamber.

Upon ignition, the compression arm 34 is driven radially inward toward the position shown in 26D. This drives its cam follower toward the minor axis of the oval cam track 40, rotating the rotor 20 to deliver power to the main shaft 16,which in turn, may drive a power shaft or other suitable power take-off (not shown).

Finally, the arm 34 swings back out to the position shown at 26A, during which time it passes the exhaust ports through which the combusted gases are exhausted.

If the rotary device of this invention is used as a diesel engine, the spark plug 50 may, of course, be omitted so that ignition occurs by heat of expansion. Similarly, if the device is to be used as a compressor, pump or blower, outlet ports may be provided at position 26C in place of the spark plug 50, and additional inlet ports 48 may be provided at position 26D. Hence, there would be two intake and two compression strokes during each rotation of the rotor 20.

While this invention has been described in conjunction with a preferred embodiment thereof, it is obvious that modification and changes therein may be made by those skilled in the art to which it pertains, without departing from the spirit and scope of this invention, as defined by the claims appended hereto.

CLAIMS

1. A rotary device comprising:

an outer member having a cylindrical inner wall;

an inner member having a complementary cylindrical periphery nested in said outer member

said members being mounted for relative rotation;

a first compression chamber comprising a cavity in said inner member opening into said periphery and having an arcuate slide surface extending radially inward from said periphery on an arc about a first axis near said periphery;

a first compression arm pivoted on said first axis with a distal surface thereof in sliding engagement with said slide surface and movable between a compressing position wherein the radially outer side working edge of said arm is disposed along said periphery and an expanded position wherein said working edge is disposed radially inward of said periphery; and

cam means for oscillating said compression arm between said compressing and expanded positions in response to relative rotation of said inner and outer members.

2. The rotary device defined by claim 1 wherein said cam means comprises:

a cam track on said outer member; and

a cam follower on said compression arm engaged in said cam track;

said cam track being configurated to produce two complete oscillations of said compression arm during each complete relative revolution between said inner and outer members.

3. The rotary device defined by claim 2 wherein:

said outer member comprises a stationary housing and said inner member comprises a rotor; and including:

an intake port in said housing opening through said inner wall at an intake stage in the rotation of said rotor wherein said compression arm is in its expanded position; and

an outlet port in said housing opening from said inner wall at an exhaust stage in the rotation of said rotor wherein said compression arm is pivoting to its compressing position.

4. The rotary device defined by claim 3 including:

an ignition stage in the quadrant of said inner wall transversed by said compression chamber after said intake stage.

5. The rotary device defined by claim 4 including:

ignition means in said housing in said ignition stage.

6. The rotary device defined by claim 4 including:

an expansion stage wherein said inner wall is imperforate in the quadrant thereof following said ignition stage.

7. The rotary device defined by claim 1 wherein:

said distal surface of the first compression arm is arcuate about said first axis.

8. The rotary device defined by claim 1 wherein:

said side working edge of the first compression arm is an arcuate continuation of said cylindrical periphery.

9. The rotary device defined by claim 8 including:

a depression in said side working edge forming a chamber when said working edge is in sliding engagement with said cylindrical inner wall.

10. The rotary device defined by claim 3 wherein:

said final compression chamber is located in a first quadrant of said rotor;

and including:

second, third and fourth compression chambers configurated as said first compression chamber respectively in second, third and fourth quadrants of said rotor;

second, third and fourth compression arms configurated as said first compression arm pivoted on said rotor about second, third and fourth axes in said second, third and fourth quadrants; and

cam follows on each of said compression arms engaged in said cam track.

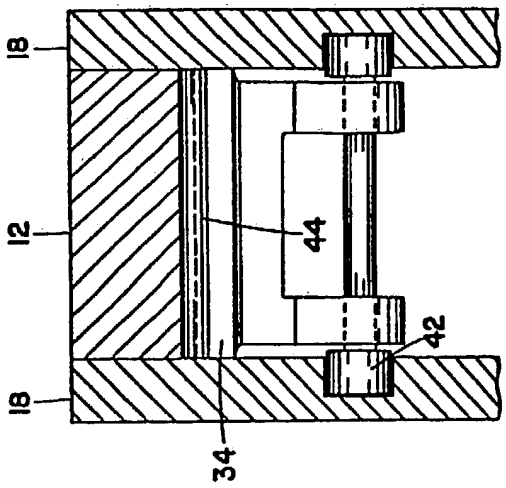
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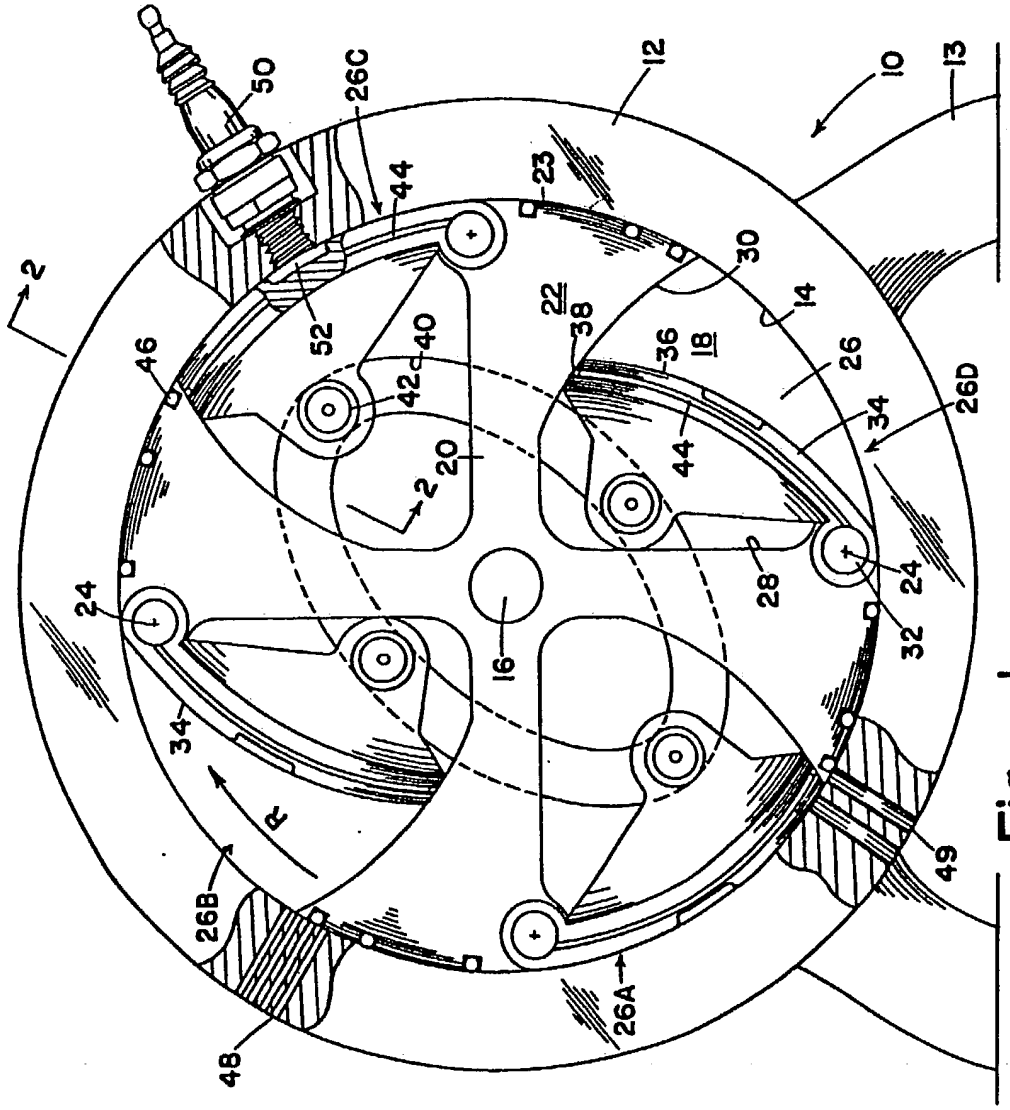
Fig. 2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26D
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26B
26A
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Fig. 1

PUB-NO: EP000103985A2

DOCUMENT-IDENTIFIER: EP 103985 A2

TITLE: Rotary engine or compressor.

PUBN-DATE: March 28, 1984

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APPL-NO: EP83304745

APPL-DATE: August 16, 1983

PRIORITY-DATA: US40997882A (August 20, 1982)

INT-CL (IPC): F01B013/06

EUR-CL (EPC): F01B013/06

US-CL-CURRENT: 418/264, 418/265

ABSTRACT:

A rotary device, such as an engine wherein compression arms are pivoted on a cylindrical rotor to oscillate in recesses opening from the cylindrical periphery of the rotor, pivoting away from the periphery during expansion and toward the periphery during compression. Cam followers on the compression arms engage in a generally oval cam track on the housing so that there are two complete oscillates, or four cycles, during each revolution of the rotor.